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PY-CEI/NRR-2679L

United States Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Perry Nuclear Power Plant
Docket No. 50-440
Supplement to License Amendment Request Pursuant to 10 CFR 50.90: One-time 5 Year Deferral of the Type A Containment Integrated Leak Rate Test (TAC NO. MB4695)

Ladies and Gentlemen:

This letter provides responses to the Nuclear Regulatory Commission Request for Additional Information dated November 26, 2002 pertaining to the Perry Nuclear Power Plant (PNPP) License Amendment Request (LAR) submitted on March 14, 2002 (PY-CEI/NRR-2607L).

The proposed LAR is required to allow a one-time deferral of the Type A Containment Integrated Leak Rate Test. Approval is still requested by March 1, 2003 in order to support the next PNPP refueling outage.

The Significant Hazards Consideration provided with the March 14, 2002 letter remains unchanged by this supplemental letter.

If you have questions or require additional information, please contact Mr. Vernon K. Higaki, Manager - Regulatory Affairs, at (440) 280-5294.

Very truly yours,

for William R. Kanda

Attachments:

1. Notarized Affidavit
2. Response to Request for Additional Information
3. Sensitivity Calculation for the ILRT Extension Risk Assessment

cc: NRC Project Manager
NRC Resident Inspector
NRC Region III
State of Ohio

A017

I, Timothy S. Rausch, hereby affirm that (1) I am General Manager, Perry Nuclear Power Plant Department of the FirstEnergy Nuclear Operating Company, (2) I am duly authorized to execute and file this certification as the duly authorized agent for The Cleveland Electric Illuminating Company, Toledo Edison Company, Ohio Edison Company, and Pennsylvania Power Company, and (3) the statements set forth herein are true and correct to the best of my knowledge, information and belief.

Timothy S. Rausch

Subscribed to and affirmed before me, the 20 day of January 20, 2003

Jane E Mott

JANE E. MOTT
Notary Public, State of Ohio
My Commission Expires Feb 20, 2005
(Recorded in Lake County)

The following Nuclear Regulatory Commission (NRC) questions were received by letter dated November 26, 2002, regarding the one-time 5 year deferral of the Type A Containment Integrated Leakage Rate Test (CILRT) License Amendment Request (LAR) submitted by the Perry Nuclear Power Plant (PNPP). The questions and their responses are provided below.

NRC Question

1. **Under the title, "Containment Inspection (ISI) Program," the PNPP describes its American Society of Mechanical Engineers (ASME) Code, Section XI visual examinations performed for the containment surfaces. The licensee is requested to provide a summary of the screening criteria used in its inservice examination program (ISEP), a summary (including location, size, root cause, etc.) of the degradations found during these examinations, and a description of any corrective actions or analytical evaluations performed when the degradation exceeded 10 percent of the shell thickness. Also, PNPP is requested to provide information regarding the Edition and the Addenda of Subsection IWE of Section XI of the ASME Code used in performing the last two inspections.**

Response

PNPP's latest containment inspections were performed during the last two refueling outages, RFO7 (March-May 1999) and RFO8 (February-March 2001). In RFO7, the first period Table IWE-2500-1, Category E-A, Item E1.12 VT-3 examinations were performed. The VT-3 examinations are allowed to be performed at the end of the 10-year inspection interval, but PNPP has elected to take a more aggressive approach and perform them over the interval such that approximately 1/3 are performed each period, with the first-period examinations being performed in RFO7. These exams, which are allowed to be performed from either the inside or outside surface, are being performed from the outside surface as it is more susceptible to corrosion since the outside surface only has a primer coat and has a history of being exposed to conditions of high humidity. In RFO8, the Table IWE-2500-1, Category E-A, Item E1.11 General Visual examinations were performed on the accessible inside and outside surfaces of the containment. The RFO7 and RFO8 inspections were performed in accordance with the 1992 Edition with 1992 Addenda of Section XI as modified by 10 CFR 50.55a(b)(2)(ix) and the following PNPP Relief Requests:

Relief Request No.	Summary of Relief Request
IR-032	Appendix J testing in lieu of IWE examinations of seals and gaskets
IR-033	Qualification of IWE/IWL Examination personnel in accordance with SNT-TC-1A in lieu of CP-189
IR-039	Relief from the VT-3 direct visual lighting and distance requirements consistent with 10 CFR 50.55a(b)(2)(ix)(B)

The screening criteria (i.e., recordable indications and acceptance criteria) for containment In-Service Inspection (ISI) visual examinations are specified in PNPP's

Visual Examination procedure, NQI-1042, "Visual Examination." For the IWE General Visual and VT-3 examinations, recordable indications are structural deformation or degradation, missing or detached items, cracked or broken welds, erosion, excessive corrosion, wear, pitting, arc strikes, gouges, surface discontinuities, dents, and degraded coatings. The acceptance criteria are no structural deformation or degradation such that the component's function is impaired, no missing or detached items, no cracks, and no corrosion or erosion of structural metal which exceeds 10% of the nominal wall thickness. All other recordable indications are evaluated by the Registered Professional Engineer (RPE), or a knowledgeable individual under the RPE's direction, to determine whether the recorded indications affect either the containment structural integrity or leak tightness.

With the exception of recent containment inspections, which are detailed below in the response to RAI 2, the degradations found during all previous containment inspections were described in the initial License Amendment Request requesting a one-time 5 year deferral of the Type A CILRT submitted on March 14, 2002 (PY-CEI/NRR-2607L). In summary, the only in-service degradations have been minor flaking and peeling of coatings on the interior surfaces of the containment and drywell, which are addressed by PNPP's nuclear coatings program, and numerous areas of general surface corrosion on the exterior surfaces of the containment (which received a primer coat, but never a top coat). The corrosion areas were checked for material loss and no significant material loss was found.

<u>NRC Question</u>

2. **Subsubarticle IWE-1240 requires the consideration of augmented inspection when the containment area(s) are subjected to standing water. Please provide information related to inspection of the bottom liner plate and embedments of the PNPP containment and drywell areas submerged in water. Specifically, you are requested to provide information regarding the frequency of inspection and results of the last inspection.**

<u>Response</u>

In accordance with Subsubarticle IWE-1220(b), with the exception of the suppression pool and drywell weir floors which form a part of the liner plate membrane, PNPP's bottom liner plate is exempt from examination as it is embedded in concrete and is totally inaccessible.

Accessible portions of the containment that are normally submerged in water are the suppression pool walls, floor, and drywell weir. The surfaces of these areas are all stainless steel and they are included in the scope of PNPP's Table IWE-2500-1, Category E-A, Item E1.11, General Visual examinations that are performed at least once each inspection period. Although not required by Subsection IWE, the examinations are performed by qualified VT-3 Visual Examination personnel. The exams are performed using high-powered lights, binoculars, and, when available, by review of videotapes made by divers during suppression pool cleaning activities. These exams were last performed in RFO7 and no indications were identified.

PNPP's containment annulus, i.e., the area in between the free standing containment vessel and the containment Shield Building, has a history of high humidity due to periodic leakage of steam into the annulus from the Main Steam Isolation Valve (MSIV) Leakage Control System (E32) and MSIV stem leakoff lines. The high humidity and its effects on the containment were evaluated under PNPP's Corrective Action program and found to have no effect on containment integrity. Design changes were made in which the E32 system was eliminated in RFO7 and the MSIV stem leakoff lines were capped during a recent (October 2002) midcycle outage. These modifications appear to have corrected the sources of the humidity within the annulus. Due to the excessive humidity, condensation would form in the annulus and there was, at times, standing water on the annulus floor. The annulus floor is actually the top of a 23-1/2 foot concrete pour. At the upper elevations of the concrete pour, the interface between the concrete and the containment vessel is filled with a compressible material composed of 3 inch thick closed cell neoprene panels. These panels extend 3 inches above the annulus floor, but do not form a watertight seal. As no evidence of accelerated corrosion was found at this interface during the course of Appendix J visual exams during the first 10-year inspection interval, the area was not classified as suspect in accordance with IWE-1240 when IWE was implemented. However, PNPP has elected to put the interface area on an increased VT-3 direct visual examination frequency of once each period. Furthermore, UT thickness exams were performed on the suppression pool side of the containment on sample areas below the annulus floor where water intrusion into the interface was most likely, and no evidence of material loss was found.

Recently (November 2002), during the course of performing Table IWE-2500-1, Category E-A, Item E1.12 exams of the containment vessel in the annulus area, the annulus floor drain sump pump was found not to be working properly. This condition resulted in the annulus floor pit, which is underneath the lower personnel airlock penetration, to fill with water above the level of the compressible material interface, which then allowed water to intrude down into the interface. Heavy surface rust was also found at the interface in this area. The surface rust was removed and some pitting was found. The deepest of the pits was 1/16 inch, well below 10% of the 1.5 inch nominal wall thickness. At the interface area where the rust was the most severe, a 2 foot long section of the compressible material was removed to a depth of approximately 9 inches below the annulus floor level. Other than at the top of the interface area, there was no corrosion found behind the compressible material. Additionally, UT thickness exams were performed on the other side (i.e., suppression poolside) of the containment vessel wall at this area and three other sample areas. The UT thickness exams were performed from the annulus floor elevation to approximately 9 feet below the annulus floor elevation. This is believed to bound the depth of the water intrusion as it is highly unlikely that the water would intrude below the containment vessel circumferential stiffener ring that is embedded 6 feet below the annulus floor. No evidence of material loss was found.

NRC Question

3. **Recognizing the hardship associated with examining seals, gaskets, and pressure retaining bolts during each inspection period, and that the examination will be performed prior to Type B testing as required by Option A of Appendix J, the staff had granted such relief to a number of licensees. However, implementation of Option B of Appendix J allows flexibility in the frequency of performing Type B testing based on the leak rate performance of the penetrations. As the performance-based testing allows certain leak rates through the penetrations, minor initial degradation of the associated seals, gaskets, and bolting may go undetected, thus, raising a potential concern for components to further degrade over the 10-year examination interval. Therefore, the schedule of examinations of seals, gaskets and pressure retaining bolting should be established based on the components' performance (i.e., plant-specific experience, replacement schedules for resilient seals, etc.) to ensure that, if Type B testing is not performed during the ILRT extension period, significant degradation of these components over this extended interval will not occur. In view of this discussion, the licensee is requested to provide a schedule for examination (and/or testing) of these components including equipment hatches and other penetrations with resilient seals.**

Response

PNPP Relief Request IR-032 allows Appendix J testing in lieu of IWE examinations of seals and gaskets, and Relief Request IR-038 allows Appendix J testing in lieu of IWE bolt torque and tension testing. Type B testing at PNPP affects a total of 63 components encompassing electrical penetrations, the containment airlocks, containment equipment hatch "O" rings, the inclined fuel transfer tube bellows, containment vacuum breaker "O" rings, and containment expansion bellow assemblies.

Electrical Penetrations

There are 36 electrical penetrations. Of this population, approximately 20% are tested during each refueling outage. The PNPP administrative leakage limit for the electrical penetrations is 25 standard cubic centimeters per minute (sccm). If an electrical penetration would fail to meet the acceptance criteria at the time, all the electrical penetrations would then be tested during that refueling outage to establish if any common mode failure mechanism exists. Presently, nine of the 36 electrical penetrations are scheduled for Type B testing in RFO9. Historical leakage data for the 36 electrical penetrations has shown that none have ever exhibited a leakage greater than the lowest sensitivity of the test equipment used.

Containment Airlocks

The containment airlocks are comprised of several components that are periodically leak tested albeit at different frequencies. A large and a small seal are tested in parallel on both the outer and inner door of both airlocks resulting in eight (8) components being tested. The door seals for both the lower and upper containment airlocks are tested once per 30 days. The acceptance criteria for the door seals testing is that leakage is to be less than 1180 sccm. The door seal leakage tests historically have exhibited minimal leakage (< 100 sccm) considering the large number of cycles the doors are subjected to. The containment airlock barrel tests are performed every 30 months. The overall leakage for the airlock barrel should also be less than 1180 sccm. The highest recorded leakage for either barrel was 945 sccm for the lower airlock barrel in 1994.

Containment Equipment Hatch

The containment equipment hatch is removed during each refueling outage to support outage work activities. The containment equipment hatch double "O" ring is Type B tested during each refueling outage. The hatch seal has an assigned leakage limit of 250 sccm. As-found leakage has never exceeded 20 sccm. The equipment hatch bolting is scheduled for VT-1 examination in RFO10 in accordance with Table IWE-2500-1, Category E-G, Item E8.10.

Inclined Fuel Transfer Tube Bellows

A two-ply bellows assembly surrounds the inclined fuel transfer tube and thus provides a flexible seal between the Inclined Fuel Transfer System (IFTS) containment penetration flange and the IFTS piping. The bellows and associated components were never subject to extended interval testing at PNPP given that the IFTS containment penetration flange is removed each refuel to support refueling activities. Type B testing of the inclined fuel transfer tube bellows remains on the original 2 year frequency. The leakage limit for the penetration is 100 sccm. Historically, the recorded as-found leakage rates for the IFTS bellows assembly have been no greater than 40 sccm.

Containment Vacuum Breaker "O" Rings

The inboard isolation valves (check valves) in the four containment vacuum breaker penetrations are tested each refueling outage. This requires the valve body-to-pipe flange "O" rings to also be tested. An administrative leakage limit of 100 sccm is assigned to each of the containment vacuum breaker "O" rings. The highest leakage ever recorded was 20 sccm in 1994.

Containment Expansion Bellows Assemblies

Eleven containment expansion bellows assemblies are tested in parallel and are on a 5 year extended test interval. The group of assemblies has a leakage limit of 100 sccm. This group has displayed minimal leakage rates since 1986. These assemblies were successfully tested during RFO8 (March 2001). The bellows assemblies are currently scheduled for testing in 2005 during RFO10.

NRC Question

4. The stainless steel bellows have been found to be susceptible to transgranular stress corrosion cracking, and the leakages through them are not readily detectable by Type B testing (See Nuclear Regulatory Commission Information Notice 92-20). The licensee is requested to provide information regarding the inspection and testing of containment bellows at PNPP.

Response

PNPP reviewed and assessed the IFTS containment bellows regarding Type B testing in March 1994 and communicated that assessment to the NRC by letter dated March 3, 1994 (PY-CEI/NRR-1676L). The IFTS containment bellows assembly is a two-ply design similar in construction and subject to the same Type B testing limitations as described in NRC Information Notice (IN) 92-20, "Inadequate Local Leak Rate Testing." IN 92-20 indicated that the LLRT test methodology utilized could not be relied upon above a threshold value that was determined to be 6 standard cubic feet per hour (scfh). This value corresponds to 2832 standard cubic centimeters per minute (sccm). The IFTS bellows testing consists of a post-maintenance between the ply leak rate test and an as-found/as-left external containment boundary local leak rate test (Type B test) each refueling outage. Historically, PNPP leakage rates determined for the IFTS containment bellows assembly have been no greater than 40.0 sccm. As stated in the response to RAI 3, the IFTS bellows is Type B tested during each refueling outage. The Type B leakage rate for the penetration during RFO8 was determined to be less than 20.0 sccm. If the leakage was found to be greater than 100 sccm during the leak testing, additional confirmatory testing and/or corrective actions would be necessary to reduce the leakage to less than the 100 sccm limit. Additionally, the latest ASME Code Section XI (VT-3) visual examination of the IFTS bellows assembly external and internal surfaces was performed in RFO8 (February 2001). No indications on the IFTS bellows assembly were noted.

NRC Question

5. Inspections of some reinforced and steel containments (e.g., North Anna, Brunswick, D. C. Cook, Oyster Creek) have indicated degradation from the non-inspectable side of the liner/steel shell of primary containments. The major non-inspectable areas of the Mark III containment, such as PNPP, include those parts of the steel shell backed by concrete, the basemat liner, and inaccessible areas inside the containment and those in the annulus. PNPP is requested to provide information addressing how potential leakage due to age-related degradation from these non-inspectable areas are factored into the risk assessment in support of the requested ILRT interval extension.

Response

Refer to the RAI 7 response.

containment shell, which is designed for an internal pressure of 15 psig, with a coincident temperature of 185°F, has an average thickness of approximately 1.5 inches.

The containment vessel is free-standing and neither provides nor receives any major structural support except at the embedment in the foundation mat and approximately 24 feet of additional concrete in the annulus region between the containment and Shield Building walls (to provide added support in the event of containment flooding). Other than the portion of the containment vessel that is concealed by the annulus concrete pour, the vessel exterior is accessible for visual examination.

Floor

The containment building foundation is a circular reinforced concrete mat 136 feet in diameter and 12 feet-6 inches thick. It supports the Shield Building, the steel containment vessel, the reactor pressure vessel pedestal, the drywell, the weir wall, and other internal structures.

The containment is anchored into the foundation mat by a 4 foot-3 inch embedment. A 0.25 inch plate runs across the bottom of the containment to complete the leak-tight membrane. The plate is flat and embedded in concrete except for the suppression pool floor, drywell weir floor, and the Drywell Equipment Drain Sumps, which all form a part of the 0.25 inch membrane. The drywell, the weir wall, and the reactor vessel pedestal reinforcing steel penetrate the 0.25 inch membrane into the concrete foundation mat. Leak detection channels are provided behind welds that are embedded in the concrete.

Penetrations

There are a number of components and systems that pass through the containment vessel shell. Several of these components and systems, with associated leak testing, are described in the response to RAI 3. Of the remaining components and systems, some are housed within guard pipes. The basic configuration of this type of penetration has the process pipe passing through an outer or guard pipe. One end of the guard pipe is open to the drywell with the other end welded closed to the process pipe outside of the reactor shield building. The welds of the closed end of the guard pipes are tested for leakage using a soap bubble solution during the performance of each CILRT, any leakage identified will be eliminated.

Inspectable Area

Considering both the free standing containment vessel and the leak-tight membrane in the containment floor (i.e., the entire containment leak-tight boundary), approximately 75% of the exterior surfaces and 90% of the interior surfaces are accessible for visual inspections. The inaccessible portions of the exterior are the vessel areas concealed by the annulus concrete pour and the areas beneath the floor leak-tight membrane. The inaccessible portions of the interior are primarily those areas of the floor leak-tight membrane that are embedded in concrete.

Industry Free Standing Containment Vessel and Liner Corrosion Events

As used herein, event means a through-wall failure of a containment vessel or containment liner. A search of industry experience found that there has not been any through-wall failure events for free standing containment vessels. However, there have been two through-wall failure events for containment liners. The events are summarized as follows.

- On September 22, 1999, during a coatings inspection at North Anna Unit 2, a small paint blister was observed and noted for later inspection and repair. Preliminary analysis determined this to be a through-wallhole. The corrosion appeared to have initiated from a 4 inch x 4 inch x 6 inch piece of lumber embedded in the concrete.

- On April 27, 1999, during a visual inspection of the Brunswick 2 drywell liner, two through-wall holes and a cluster of five small defects (pits) were discovered. The through-wall holes were believed to have been started from the coated (visible) side. The cluster of defects was caused by a workers glove embedded in the concrete.

PNPP Containment Inspection Program

During PNPP's first 10 year In-Service Inspection (ISI) interval, which included operating cycles and refueling outages through RFO6, containment inspections were performed in accordance with PNPP's 10 CFR 50, Appendix J program. As such, physically accessible interior and exterior containment surfaces were visually inspected prior to each of the required Type A CILRT. Although not required by Appendix J, PNPP performed all these examinations utilizing ASME Section XI VT-3 qualified visual examination personnel. Results of those exams are as follows.

During RFO1 (June-July 1989), a general inspection of physically accessible surfaces of the containment was performed. In-service indications recorded included areas of minor surface rust on the containment exterior (which has a primer coat, but no top coat) and minor paint blisters/flaking on the containment interior. None of the indications affected the structural integrity of the containment vessel. The paint blisters/flaking was addressed by the corrective maintenance program. Two gouges from construction, one 1/8 inch deep and one 1/4 inch deep, were identified, evaluated as acceptable for continued operation, and subsequently weld repaired in RFO4.

During a Mid-Cycle Outage (January-February 1993), a general inspection of physically accessible surfaces of the containment was performed. Results were similar to those of previous exams.

During RFO4 (April-June 1994), a general inspection of physically accessible surfaces of the containment was performed. Results were similar to those of previous exams.

During RFO6 (September-October 1997), an inspection of physically accessible surfaces of the containment vessel was performed. Results were similar to those of previous exams with some additional minor corrosion areas identified on the exterior of the containment dome. All the rust areas on the containment exterior were found acceptable "as-is".

In 1998, PNPP updated the In-Service Examination Program (ISEP) for the second 10-year ISI interval. The update included incorporation of the ASME Section XI, Subsection IWE (Metal Containment) and IWL (Concrete Containment) requirements of the 1992 Edition with the 1992 Addenda as modified by 10 CFR 50.55a(b)(2)(ix) and the following PNPP Relief Requests.

Relief Request No.	Summary of Relief Request
IR-032	Appendix J testing in lieu of IWE examinations of seals and gaskets
IR-033	Qualification of IWE/IWL Examination personnel in accordance with SNT-TC-1A in lieu of CP-189
IR-034	Use of Nuclear Coatings Program in lieu of IWE preservice examination requirements for reapplied paint or coatings
IR-035	Use of Nuclear Coatings Program in lieu of IWE visual examinations prior to the removal of paint or coatings
IR-037	Relief from having to perform IWE successive examination requirements when degraded areas are accepted by repairs in accordance with Article IWA-4000
IR-038	Visual examinations and Appendix J testing of Class MC pressure retaining bolting in lieu of the IWE bolt torque and tension test requirements
IR-039	Relief from the VT-3 direct visual lighting and distance requirements consistent with 10 CFR 50.55a(b)(2)(ix)(B)
IR-040	Use of Code Case N-605 for UT thickness exams of areas requiring augmented examination in lieu of IWE UT thickness requirements.
IR-041	Use of the 1989 Edition repair/replacement documentation requirements in lieu of the 1992 Edition with the 1992 Addenda requirements

Note, this list includes all of the Relief Requests that modify the IWE/IWL containment inspection program.

In accordance with these requirements, the Subsection IWE, Table IWE-2500-1, Category E-A, Item E1.11 General Visual examination requirements are performed at least once each ISI period (approximately 40 months) and the Item E1.12 VT-3 visual examination requirements are performed once an interval. The General Visual examinations require inspection of essentially 100% of the physically accessible containment interior and exterior surfaces. The VT-3 examinations are a more detailed inspection, performed with increased lighting and resolution requirements, and may be performed from the interior or the exterior of the containment. The VT-3 examinations may be performed at the end of the 10-year inspection interval. However, PNPP has elected to take a more aggressive approach and perform the

VT-3 examinations over the interval such that approximately 1/3 are performed each period. Additionally, PNPP chose to include the physically accessible portions of the containment exterior in the VT-3 examination scope since the exterior is more subject to corrosion.

In accordance with Subsubarticle IWE-1240, surface areas likely to experience accelerated degradation and aging require augmented examinations. PNPP's containment annulus, i.e., the area in between the free standing containment vessel and the containment Shield Building, has a history of high humidity. This condition and its resolution is described in the response to RAI 2. As stated in the RAI 2 response, containment integrity has not been affected.

The results of the containment inspections conducted thus far during the second 10-year inspection interval are as follows:

During RFO7 (March-May 1999), the containment vessel dome exterior and lower shell course exterior received a VT-3 inspection. The inspection identified areas with minor corrosion on the containment dome (similar to that identified in the previous Appendix J visual exams). Also, the containment annulus concrete surface received a VT-3C examination in accordance with ASME Section XI, Subsection IWL, Table IWL-2500-1, Category L-A. This inspection identified some small eroded concrete surface areas, with exposed aggregate and minor spalling, on the annulus floor. The Corrective Action Program was used to assess all of the conditions. All areas were found acceptable "as-is." Furthermore, the cause of the concrete erosion, overhead leakage from E32 system lines, was eliminated by a design change implemented during RFO7.

During RFO8 (February-March 2001), the physically accessible containment interior and exterior surfaces received a General Visual inspection and the annulus concrete received a VT-3C examination again. These inspections identified the same indications that were recorded during RFO7, which were found acceptable "as-is."

During Pre-RFO9 ISI examination activities (November 2002), the exterior of the middle containment shell courses received a VT-3 inspection. These inspections identified areas with surface rust similar to those reported in previous visual inspections. The corrosion was checked for measurable material loss and none was found. During the course of performing these exams from the annulus area, it was found that the annulus floor drain sump pump was not working properly. This condition resulted in an area of the annulus floor, which forms a pit underneath the lower personnel airlock penetration, filling with water above the level of the compressible material interface, which then allowed water to intrude down into the interface. Heavy surface rust was also found at the interface in this area. This condition and its resolution is described in the response to RAI 2. As stated in the RAI 2 response, the deepest identified pit was 1/16 inch, well below 10% of the 1.5 inch nominal wall thickness and the UT inspections of the containment shell showed no evidence of material loss.

All the IWE examinations, including the General Visual examinations, were performed by VT-3 visual examination personnel. The IWL examinations were performed by VT-3C visual examination personnel. All of these visual examination personnel are qualified in accordance with PNPP procedure TMP-2402, "Qualification and Certification of Nondestructive Testing Personnel." This procedure requires documenting the necessary experience, training, visual acuity, and certifications in accordance with American Society of Nondestructive Testing SNT-TC-1A. Additionally, all the VT-3 examination personnel assigned to perform containment inspections have received IWE specific visual examination training and the VT-3C personnel must also have ANSI N45.2.6 Civil Inspector qualifications.

With PNPP's aggressive approach to implementation of the Subsection IWE requirements, utilization of VT-3 visual examination personnel for the General Visual inspections, and the steps taken to ensure that the humidity problems in the annulus did not cause any accelerated corrosion, the PNPP containment inspection program provides a high degree of assurance that degradation of the containment structure is identified and corrected before a containment leakage path can be introduced.

Liner Corrosion Analysis

The corrosion analysis (Attachment 3) utilizes the referenced Calvert Cliffs assessment methodology to estimate the likelihood and risk-implication of degradation-induced leakage occurring and going undetected in visual examinations during the extended test interval.

Consistent with the Calvert Cliffs methodology, the following issues are addressed within the analysis:

- Differences between the containment basemat and the containment cylinder and dome;
- The historical steel shell flaw likelihood due to concealed corrosion;
- The impact of aging;
- The corrosion leakage dependency on containment pressure; and
- The likelihood that visual inspections will be effective at detecting a flaw.

As a result, the analysis shows the impact upon the base case (submitted by letter PY-CEI/NRR-2607L, dated March 14, 2002) is a delta LERF of 3.2E-9, a delta dose rate of 1.8E-3 person-rem/year, and a delta conditional containment failure probability of 0.05% for the interval extension. Hence, the analysis indicates that overall, the CILRT interval extension, including age-adjusted corrosion impacts, would have minimal impact upon plant risk.

Perry Nuclear Power Plant

SENSITIVITY CALCULATION FOR THE ILRT EXTENSION RISK ASSESSMENT

Background

A previous analysis [1] was performed to evaluate the risk impact of extending the Integrated Leak Rate Test (ILRT) interval for the Perry Nuclear Power Plant (PNPP). That analysis was performed using the recommended approach developed by NEI [2] for performing assessments of one-time extensions for Containment ILRT surveillance intervals. The results of that analysis are summarized in Table 1.

Table 1
Perry ILRT Cases: Base, 3 to 10, and 3 to 15 Yr Extensions

	Base Case 3 Years			Extend to 10 Years			Extend to 15 Years		
EPRI Class	CDF/Yr	Per-Rem	Per-Rem/Yr	CDF/Yr	Per-Rem	Per-Rem/Yr	CDF/Yr	Per-Rem	Per-Rem/Yr
1	1.42E-06	4.43E+03	6.28E-03	1.01E-06	4.43E+03	4.47E-03	7.15E-07	4.43E+03	3.17E-03
2	1.89E-08	1.25E+06	2.37E-02	1.89E-08	1.25E+06	2.37E-02	1.89E-08	1.25E+06	2.37E-02
3a	1.59E-07	4.43E+04	7.06E-03	5.31E-07	4.43E+04	2.35E-02	7.97E-07	4.43E+04	3.53E-02
3b	1.59E-08	1.55E+05	2.47E-03	5.31E-08	1.55E+05	8.24E-03	7.97E-08	1.55E+05	1.24E-02
4	0		0	0		0	0		0
5	0		0	0		0	0		0
6	0		0	0		0	0		0
7	4.29E-06	6.54E+05	2.81E+00	4.29E-06	6.54E+05	2.31E+00	4.29E-06	6.54E+05	2.81E+00
8	0.00E+00	1.25E+06	0.00E+00	0.00E+00	1.25E+06	0.00E+00	0.00E+00	1.25E+06	0.00E+00
Total	5.90E-06		2.85E+00	5.90E-06		2.87E+00	5.90E-06		2.88E+00
ILRT Dose Rate from 3a and 3b			9.54E-03			3.18E-02			4.77E-02
% of Total			0.34%			1.11%			1.66%
Delta Dose Rate (10 to 15 yr)									1.59E-02
LERF from 3b			1.59E-08			5.31E-08			7.97E-08
Delta LERF (10 to 15 yr)									2.66E-08
CCFP %			73.30%			73.93%			74.38%
Delta CCFP % (10 to 15 yr)									0.45%

The change in LERF from extending the interval to 15 years from the current 10 year requirement was estimated to be 2.7E-8 /yr. This is below the Regulatory Guide 1.174 [3] acceptance criteria threshold of 1.0E-7. Additionally, the dose increase was estimated to be 1.6E-2 Person-rem /yr, or 0.6%, and the conditional containment failure probability increase was estimated to be 0.5%. Both of these increases are also considered to be small. As such, the ILRT interval extension is judged to have a minimal impact on plant risk, and is therefore acceptable.

Recently, the NRC issued a series of Requests for Additional Information (RAIs) in response to the one-time relief request for the ILRT surveillance interval. Two of the RAIs related to the risk assessment are provided below.

> <u>Request for Additional Information No. 5:</u>
>
> Inspections of some reinforced and steel containments (e.g., North Anna, Brunswick, D.C. Cook, Oyster Creek) have indicated degradation from the non-inspectable side of the liner/steel shell of primary containments. The major non-inspectable areas of the Mark III containment, such as PNPP, include those parts of the steel shell backed by concrete, the basemat liner, and inaccessible areas inside the containment and those in the annulus. PNPP is requested to provide information addressing how potential leakage due to age-related degradation from these non-inspectable areas are factored into the risk assessment in support of the requested ILRT interval extension.
>
> <u>Request for Additional Information No. 7:</u>
>
> Please describe the planned approach and schedule for addressing the risk assessment aspects of RAI 5. The staff is particularly interested in an assessment of the likelihood and risk-implication of degradation-induced leakage occurring and going undetected in visual examinations during the extended test interval. Calvert Cliffs and other licensees have provided such assessments, and that methodology is considered applicable to other plant types. It should be noted however that the Calvert Cliffs application considered only the inspection of the inside surface of containment. For free standing containments, examinations are performed for both the inner and outer surfaces. The inspections of outer surfaces provide further assurance that degradation will not be significant. Please discuss those inspections and their impact on risk, e.g., how much of the outer surface is accessible/inspected? Are any portions of the shell that are inaccessible from the inside inspected from the outside, and vice versa? Also, it would seem that those portions of the shell that are free standing (not backed by concrete) would have fewer relevant corrosion mechanisms. Some discussion in this area would also be helpful.

The analysis that follows addresses the risk assessment portion of these RAIs.

Steel Shell Corrosion Analysis

The analysis utilizes the referenced Calvert Cliffs assessment [4] to estimate the likelihood and risk-implication of degradation-induced leakage occurring and going undetected in visual examinations during the extended test interval. It should be noted that the Calvert Cliffs analysis was performed for a concrete cylinder and dome containment with a steel liner whereas the Perry containment vessel is a free standing cylindrical steel structure with an ellipsoidal dome. Both sites do however have a concrete basemat with a steel liner. As such, not all aspects of the Calvert Cliffs analysis are directly applicable for Perry. Each of the analysis steps is described below with their relationship to the Calvert analysis noted where applicable.

The following approach is used to determine the change in likelihood, due to extending the ILRT, of detecting corrosion of the containment steel shell. This likelihood is then used to determine the resulting change in risk. Consistent with the Calvert Cliffs analysis, the following issues are addressed:

- Differences between the containment basemat and the containment cylinder and dome;
- The historical steel shell flaw likelihood due to concealed corrosion;
- The impact of aging;
- The corrosion leakage dependency on containment pressure; and
- The likelihood that visual inspections will be effective at detecting a flaw.

<u>Assumptions</u>

A. Consistent with the Calvert analysis, a half failure is assumed for basemat concealed liner corrosion due to the lack of identified failures. (See Table 2, Step 1.)

B. The two events used to estimate the liner flaw probability in the Calvert Cliffs analysis are also assumed to be applicable to the free standing steel shell at Perry. This is considered to be conservative since no serious corrosion events have been identified at sites with free standing steel shell containments.

C. For consistency with the Calvert Cliffs analysis, the estimated historical flaw probability is also limited to 5.5 years to reflect the years since September 1996 when 10 CFR 50.55a started requiring visual inspection. Additional success data was not used to limit the aging impact of this corrosion issue, even though inspections were being performed prior to this date (and have been performed since the time frame of the Calvert analysis), and there is no evidence that additional corrosion issues were identified. (See Table 2, Step 1.) Data from non-liner sites was also conservatively not factored into the flaw likelihood determination.

D. Consistent with the Calvert analysis, the steel shell flaw likelihood is assumed to double every five years. This is based solely on judgment and is included in this analysis to address the increase likelihood of corrosion as the steel shell ages. Sensitivity studies are included that address doubling this rate every 10 years and every two years. (See Table 2, Steps 2 and 3.)

E. In the Calvert Cliffs analysis, the likelihood of the containment atmosphere reaching the outside atmosphere given a liner flaw exists was estimated as a function of the pressure inside the Containment. For Perry, however, since the steel shell does represent the containment boundary, this reduction factor is not applied and all undetected flaws in the steel shell are conservatively assumed to lead to an early containment failure. An additional assumption is applied, however, that 90% of these flaws lead to EPRI release Class 3a, and 10% lead to EPRI release Class 3b. This is roughly consistent with the NEI Guidance [2] methodology that shows a factor of 10 lower frequency on the Class 3b events compared to the Class 3a events. A sensitivity study is included that addresses a very conservative assumption that 100% of the flaws result in EPRI Class 3b scenarios. (See Table 4 for sensitivity studies.)

F. Consistent with the Calvert analysis, the likelihood of leakage escape (due to crack formation) in the basemat region is considered to be less likely than the containment cylinder and dome region. (See Table 2, Step 4.)

G. Consistent with the Calvert analysis, a 5% visual inspection detection failure likelihood given the flaw is visible and a total detection failure likelihood of 10% is used. To date, all liner corrosion events have been detected through visual inspection. (See Table 2, Step 5.) Again, this is considered conservative since the majority of both sides of the steel shell are visible at Perry whereas only portions of the interior surface are visible at Calvert Cliffs. Sensitivity studies are included that evaluate total detection failure likelihood of 5% and 15%, respectively. (See Table 4 for sensitivity studies.)

H. Consistent with the Calvert analysis, all non-detectable containment failures are assumed to result in early releases. This approach avoids a detailed analysis of containment failure timing and operator recovery actions.

Analysis

Table 2
Steel Shell Corrosion Base Case

		Containment Cylinder and Dome	Containment Basemat
1	**Historical Steel Shell Flaw Likelihood** Failure Data: Containment location specific (consistent with Calvert Cliffs analysis).	Events: 2 2/(70 * 5.5) = **5.2E-3**	Events: 0 (assume half a failure) 0.5/(70 * 5.5) = **1.3E-3**
2	**Age Adjusted Steel Shell Flaw Likelihood** During 15-year interval, assume failure rate doubles every five years (14.9% increase per year). The average for 5th to 10th year is set to the historical failure rate (consistent with Calvert Cliffs analysis).	Year / Failure Rate: 1 — 2.1E-3 avg 5-10 — 5.2E-3 15 — 1.4E-2 **15 year average = 6.27E-3**	Year / Failure Rate: 1 — 5.0E-4 avg 5-10 — 1.3E-3 15 — 3.5E-3 **15 year average = 1.57E-3**
3	**Flaw Likelihood at 3, 10, and 15 years** Uses age adjusted liner flaw likelihood (Step 2), assuming failure rate doubles every five years (consistent with Calvert Cliffs analysis – See Table 6 of Reference [4]).	**0.71% (1 to 3 years)** **4.06% (1 to 10 years)** **9.40% (1 to 15 years)** (Note that the Calvert analysis presents the delta between 3 and 15 years of 8.7% to utilize in the estimation of the delta-LERF value. For this analysis, however, the values are calculated based on the 3, 10, and 15 year intervals consistent with the original evaluation shown in Table 1, and then the delta-LERF values are determined from there.)	**0.18% (1 to 3 years)** **1.02% (1 to 10 years)** **2.35% (1 to 15 years)** (Note that the Calvert analysis presents the delta between 3 and 15 years of 2.2% to utilize in the estimation of the delta-LERF value. For this analysis, however, the values are calculated based on the 3, 10, and 15 year intervals consistent with the original evaluation shown in Table 1, and then the delta-LERF values are determined from there.)

Table 2
Steel Shell Corrosion Base Case

		Containment Cylinder and Dome	**Containment Basemat**
4	**Likelihood of Breach in Containment Given Steel Shell Flaw** Since the Perry containment boundary is the free standing steel shell, assume that a flaw leads to early containment failure (compared to 1.1% in the Calvert Cliffs analysis). The basemat failure probability is assumed to be 1% (compared to 0.11% in the Calvert analysis).	**100%** (Assume 90% result in EPRI Release Class 3a and 10% result in EPRI Release Class 3b)	**1%** (Assume 90% result in EPRI Release Class 3a and 10% result in EPRI Release Class 3b)
5	**Visual Inspection Detection Failure Likelihood** Utilize assumptions consistent with Calvert Cliffs analysis.	**10%** 5% failure to identify visual flaws plus 5% likelihood that the flaw is not visible (not through-cylinder but could be detected by ILRT) All events have been detected through visual inspection. 5% visible failure detection is a conservative assumption.	**100%** Cannot be visually inspected.
6	**Likelihood of Non-Detected Containment Leakage** (Steps 3 * 4* 5)	**0.07% (at 3 years)** 0.7% * 100% * 10% **0.41% (at 10 years)** 4.1% * 100% * 10% **0.94% (at 15 years)** 9.4% * 100% * 10%	**0.002% (at 3 years)** 0.2% * 1% * 100% **0.010% (at 10 years)** 1.0% * 1% * 100% **0.024% (at 15 years)** 2.4% * 1% * 100%

The total likelihood of the corrosion-induced, non-detected containment leakage is the sum of Step 6 for the containment cylinder and dome and the containment basemat as summarized below.

<u>Total Likelihood of Non-Detected Containment Leakage due to Corrosion</u>

At 3 years: 0.071% + 0.002% = 0.073%

At 10 years: 0.41% + 0.010% = 0.42%

At 15 years: 0.94% + 0.024% = 0.96%

Table 3 then shows the results of the updated ILRT assessment including the potential impact from non-detected containment leakage scenarios assuming that 90% of the leakages result in EPRI Class 3a and 10% result in EPRI Class 3b.

Table 3
Perry ILRT Cases: Base, 3 to 10, and 3 to 15 Yr Extensions
(Including Age Adjusted Steel Shell Corrosion Likelihood)

	Base Case 3 Years			Extend to 10 Years			Extend to 15 Years		
EPRI Class	CDF/Yr	Per-Rem	Per-Rem/Yr	CDF/Yr	Per-Rem	Per-Rem/Yr	CDF/Yr	Per-Rem	Per-Rem/Yr
1	1.41E-06	4.43E+03	6.25E-03	9.83E-07	4.43E+03	4.35E-03	6.58E-07	4.43E+03	2.92E-03
2	1.89E-08	1.25E+06	2.36E-02	1.89E-08	1.25E+06	2.36E-02	1.89E-08	1.25E+06	2.36E-02
3a	1.63E-07	4.43E+04	7.23E-03	5.53E-07	4.43E+04	2.45E-02	8.48E-07	4.43E+04	3.76E-02
3b	1.64E-08	1.55E+05	2.54E-03	5.55E-08	1.55E+05	8.61E-03	8.53E-08	1.55E+05	1.32E-02
7	4.29E-06	6.54E+05	2.81E+00	4.29E-06	6.54E+05	2.81E+00	4.29E-06	6.54E+05	2.81E+00
8	0.00E+00	1.25E+06	0.00E+00	0.00E+00	1.25E+06	0.00E+00	0 00E+00	1.25E+06	0.00E+00
Total	5.90E-06		2.85E+00	5.90E-06		2.87E+00	5.90E-06		2.88E+00
ILRT Dose Rate from 3a and 3b			9.76E-03 (+2.2E-04)			3.31E-02 (+1.3E-03)			5.08E-02 (+3.1E-03)
% of Total			0.34% (-)			1.15% (+0.04%)			1.76% (+0.10%)
Delta Dose Rate from 3a and 3b (10 to 15 yr)									1.77E-02 (+1.8E-03)
LERF from 3b			1.64E-08 (+5.0E-10)			5.55E-08 (+2.4E-09)			8.53E-08 (+5.6E-09)
Delta LERF (10 to 15 yr)									2.98E-08 (+3.2E-09)
CCFP %			73.31% (+0 01%)			73.97% (+0 04%)			74.48% (+0.10%)
Delta CCFP % (10 to 15 yr)									0.50% (+0.05%)

Based on the results in Table 3, it can be seen that including corrosion effects in the ILRT assessment would not alter the conclusions from the original analysis. That is, the change in LERF from extending the interval to 15 years from the current 10 year requirement is estimated to be about 3.0E-8 /yr. This is below the Regulatory Guide 1.174 [3] acceptance criteria threshold of 1.0E-7. Additionally, the dose increase from 3a and 3b is estimated to be about 1.8E-2 person-rem/yr resulting in a net dose increase of 1.6E-2 person-rem/yr, or 0.6%, and the conditional containment failure probability increase is estimated to be 0.5%. Both of these increases are also considered to be small. As such, the ILRT interval extension is judged to have a minimal impact on plant risk (including age-adjusted corrosion impacts), and is therefore acceptable.

<u>Sensitivity Studies</u>

Additional sensitivity cases were also developed to gain an understanding of the sensitivity of this analysis to the various key parameters. These results are summarized in Table 4.

Table 4
Steel Shell Corrosion Sensitivity Cases

		Visual Inspection & Non-Visual Flaws (Step 5)			**LERF Increase From Corrosion (10 to 15 years)**	**Total LERF Increase From ILRT Extension (10 to 15 years)**
Base Case Doubles every 5 yrs	**Base Case** (100% Shell, 1% Basemat)	**Base Case** 10%	**Base Case** 10%	**Base Case** 5.3E-09	**Base Case** 3.2E-09	**Base Case** 3.0E-08
Doubles every 2 yrs	Base	Base	Base	1.2E-08	1.0E-08	3.7E-08
Doubles every 10 yrs	Base	Base	Base	4.4E-09	2.3E-09	2.9E-08
Base	Base	*15%*	Base	7.8E-09	4.8E-09	3.1E-08
Base	Base	*5%*	Base	2.7E-09	1.7E-09	2.8E-08
Base	Base	Base	*100%*	5.3E-08	3.2E-08	5.9E-08
Base	Base	Base	*1%*	5.3E-10	3.2E-10	2.7E-08
			<u>Lower Bound</u>			
Doubles every 10 yrs	Base	5%	1%	2.3E-10	1.2E-10	2.7E-08
			<u>Upper Bound</u>			
Doubles every 2 yrs	Base	15%	100%	1.8E-07	1.5E-07	1.8E-07

Summary and Conclusions

This analysis provides a sensitivity evaluation of considering potential corrosion impacts within the framework of the ILRT interval extension risk assessment. The analysis confirms that the ILRT interval extension has a minimal impact on plant risk. Additionally, a series of parametric sensitivity studies regarding the potential age related corrosion effects on the steel shell also indicate that even with very conservative assumptions, the conclusions from the original analysis would not change. That is, the ILRT interval extension is judged to have a minimal impact on plant risk and is therefore acceptable.

References

[1] *ILRT Extension*, First Energy PNPP Calculation No. PSA-011, Rev. 0, January 2002.

[2] *Interim Guidance for Performing Risk Impact Assessments In Support of One-Time Extensions for Containment Integrated Leakage Rate Test Intervals,* Developed for NEI by John M. Gisclon, EPRI Consultant, William Parkinson and Ken Canavan, Data Systems and Solutions, November 2001.

[3] *An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis,* Regulatory Guide 1.174, July 1998.

[4] *Response to Request for Additional Information Concerning the License Amendment Request for a One-Time Integrated Leakage Rate Test Extension,* Letter from Mr. C. H. Cruse (Calvert Cliffs Nuclear Power Plant) to NRC Document Control Desk, March 27, 2002.

Base Case and Corrosion Sensitivity Cases for Perry

Original Analysis

Release type	Person-rem Perry Dose	Frequency CDF	Base Case 3 in 10 yrs	Person-rem/yr Dose	Frequency CDF	Case 1 1 in 10 yrs	Person-rem/yr Dose	Frequency CDF	Case 2 1 in 15 yrs	Person-rem/yr Dose		
1	4 43E+03	1 42E-06		6 27E-03	1 01E-06		4 46E-03	7 15E-07		3 17E-03		
2	1 25E+06	1 89E-08		2 36E-02	1 89E-08		2 36E-02	1 89E-08		2 36E-02		
3a	4 43E+04	1 59E-07		7 06E-03	5 31E-07	*3 33	2 35E-02	7 97E-07	*5 0	3 53E-02		
3b	1 55E+05	1 59E-08		2 47E-03	5 31E-08	*3 33	8 23E-03	7 97E-08	*5 0	1 23E-02		
7	6 54E+05	4 29E-06		2 81E+00	4 29E-06		2 81E+00	4 29E-06		2 81E+00		
8	1,25E+06	0 00E+00		0 00E+00	0 00E+00		0 00E+00	0 00E+00		0 00E+00		
Total		5 90E-06		2 8451	5 90E-06		2 8655	5 90E-06		2 8801		
Base CDF	5 90E-06		Risk Contribution,	0 33%		Risk Contribution:	1 11%		Risk Contribution:	1 65%		
			from 3a and 3b·	9 53E-03		from 3a and 3b·	3 18E-02		from 3a and 3b·	4 76E-02		
			3b LERF,	1 59E-08		3b LERF,	5 31E-08		3b LERF;	7 97E-08		
			CCFP·	73.30%		CCFP·	73 93%		CCFP·	74 38%		
									10 to 15 Increase (Person-rem/yr)·	1 46E-02	1 59E-02	
									3 to 15 Increase (Person-rem/yr)·	3 50E-02		
									10 to 15 Delta-LERF:	2.66E-08		
									3 to 15 Delta-LERF,	6 37E-08		
									10 to 15 Delta-CCFP:	0 45%		
									3 to 15 Delta-CCFP·	1 08%		

Including Corrosion Effects (Base Case - Flaw rate doubles every 5 years)

Release type	Person-rem Perry Dose	Frequency CDF	Base Case 3 in 10 yrs	Person-rem/yr Dose	Frequency CDF	Case 1 1 in 10 yrs	Person-rem/yr Dose	Frequency CDF	Case 2 1 in 15 yrs	Person-rem/yr Dose		
1	4 43E+03	1 41E-06		6 25E-03	9 83E-07		4 35E-03	6 58E-07		2.92E-03		
2	1 25E+06	1 89E-08	Corrosion Addition	2 36E-02	1 89E-03	Corrosion Addition	2 36E-02	1 89E-08	Corrosion Addition	2.36E-02		
3a	4 43E+04	1 63E-07	3 86E-09	7 23E-03	5 53E-07	2.21E-08	2 45E-02	8 48E-07	5 12E-08	3 76E-02		
3b	1 55E+05	1 64E-08	4 29E-10	2.54E-03	5 55E-08	2 46E-09	8 61E-03	8 53E-08	5 68E-09	1.32E-02		
7	6 54E+05	4 29E-06		2 81E+00	4 29E-06		2 81E+00	4 29E-06		2.81E+00		
8	1 25E+06	0 00E+00		0 00E+00	0 00E+00		0 00E+00	0 00E+00		0 00E+00		
Total		5 90E-06		2 8453	5 90E-06		2 8667	5 90E-06		2.8830		
Base CDF	5 90E-06		Risk Contribution,	0 34%		Risk Contribution:	1.15%		Risk Contribution:	1.76%		
			from 3a and 3b·	9 76E-03		from 3a and 3b·	3 31E-02		from 3a and 3b·	5 08E-02		
			3b LERF,	1 64E-08		3b LERF;	5 55E-08		3b LERF,	8 53E-08		
			CCFP·	73.31%		CCFP·	73 97%		CCFP·	74 48%		
From Calvert Analysis									10 to 15 Increase (Person-rem/yr)	1 62E-02	1 77E-02	1 79E-03
		Cylinder	Basemat	Total					3 to 15 Increase (Person-rem/yr)·	3 77E-02		
1 to 3 years		0 71%	0 18%						10 to 15 Delta-LERF,	2 98E-08		
1 to 10 years		4 06%	1 02%						3 to 15 Delta-LERF,	6 90E-08		
1 to 15 years		9 40%	2 35%						10 to 15 Delta-CCFP:	0 50%		
Other Assumptions									3 to 15 Delta-CCFP:	1.17%		
Containment Breach		100 0%	1 0%									
Visual Inspection Failures		10 0%	100 0%						3 to 15 Delta-LERF from Corrosion:	5.26E-09		
EPRI Class 3a Fraction		90 0%	90 0%						10 to 15 Delta-LERF from Corrosion:	3 23E-09		
EPRI Class 3b Fraction		10 0%	10 0%									
Increases to 3a and 3b Frequencies												
		0 0639%	0 0016%	0 0655%	0 3654%	0 0091%	0 3745%	0 8460%	0 0212%	0 8672%		
		C 0071%	0 0002%	0 0073%	0 0406%	0 0010%	0 0416%	0 0940%	0 0024%	0 0964%		
				0 0728%			0 4162%			0 9635%		

Including Corrosion Effects (Sensitivity Case 1 - Flaw rate doubles every 2 years)

Release type	Person-rem	Frequency	Base Case	Person-rem/yr	Frequency	Case 1	Person-rem/yr	Frequency	Case 2	Person-rem/yr
	Perry Dose	CDF	3 in 10 yrs	Dose	CDF	1 in 10 yrs	Dose	CDF	1 in 15 yrs	Dose
1	4 43E+03	1 41E-06		6 27E-03	9 86E-07		4 37E-03	5 94E-07		2 63E-03
2	1 25E+06	1 89E-08	Corrosion Addition	2 36E-02	1 89E-08	Corrosion Addition	2 36E-02	1 89E-08	Corrosion Addition	2 36E-02
3a	4 43E+04	1 60E-07	1 11E-09	7 11E-03	5 50E-07	1 88E-08	2 44E-02	9 06E-07	1 09E-07	4 01E-02
3b	1 55E+05	1 61E-08	1 23E-10	2 49E-03	5 52E-08	2 09E-09	8 55E-03	9 18E-08	1 21E-08	1 42E-02
7	6 54E+05	4 29E-06		2 81E+00	4 29E-06		2 81E+00	4 29E-06		2 81E+00
8	1 25E+06	0 00E+00		0 00E+00	0 00E+00		0 00E+00	0 00E+00		0 00E+00
Total		5 90E-06		2 8451	5 90E-06		2 8666	5 90E-06		2 8863
Base CDF	5 90E-06		Risk Contribution:	0 34%		Risk Contribution:	1 15%		Risk Contribution:	1 88%
			from 3a and 3b:	9 59E-03		from 3a and 3b:	3 29E-02		from 3a and 3b:	5 44E-02
			3b LERF.	1 61E-08		3b LERF.	5 52E-08		3b LERF.	9 18E-08
			CCFP:	73 30%		CCFP:	73 97%		CCFP:	74 59%
From Estimated Change									10 to 15 Increase (Person-rem/yr)	1 97E-02
		Cylinder	Basemat	Total					3 to 15 Increase (Person-rem/yr)	4 11E-02
1 to 3 years		0 20%	0 05%						10 to 15 Delta-LERF.	3 66E-08
1 to 10 years		3 46%	0 86%						3 to 15 Delta-LERF:	7.57E-08
1 to 15 years		20 07%	5 02%						10 to 15 Delta-CCFP:	0 62%
Other Assumptions									3 to 15 Delta-CCFP:	1.28%
Containment Breach		100 0%	1 0%							
Visual Inspection Failures		10 0%	100 0%						3 to 15 Delta-LERF from Corrosion:	1.20E-08
EPRI Class 3a Fraction		90 0%	90 0%						10 to 15 Delta-LERF from Corrosion:	1 00E-08
EPRI Class 3b Fraction		10 0%	10 0%							
Increases to 3a and 3b Frequencies										
		0 0183%	0 0005%	0 0188%	0 3110%	0 0078%	0 3188%	1 8061%	0 0452%	1 8512%
		0 0020%	0 0001%	0 0021%	0 0346%	0 0009%	0 0354%	0 2007%	0 0050%	0 2057%
				0 0209%			0 3542%			2.0569%

Including Corrosion Effects (Sensitivity Case 2 - Flaw rate doubles every 10 years)

Release type	Person-rem	Frequency	Base Case	Person-rem/yr	Frequency	Case 1	Person-rem/yr	Frequency	Case 2	Person-rem/yr
	Perry Dose	CDF	3 in 10 yrs	Dose	CDF	1 in 10 yrs	Dose	CDF	1 in 15 yrs	Dose
1	4 43E+03	1 41E-06		6 24E-03	9 79E-07		4 34E-03	6 64E-07		2 94E-03
2	1 25E+06	1 89E-08	Corrosion Addition	2 36E-02	1 89E-08	Corrosion Addition	2 36E-02	1 89E-08	Corrosion Addition	2.36E-02
3a	4 43E+04	1 65E-07	5 76E-09	7 31E-03	5 56E-07	2 49E-08	2 46E-02	8 42E-07	8 42E-07	3 73E-02
3b	1 55E+05	1 66E-08	6 40E-10	2 57E-03	5 59E-08	2 77E-09	8 60E-03	8 47E-08	8 47E-08	1.31E-02
7	6 54E+05	4 29E-06		2 81E+00	4 29E-06		2 81E+00	4 29E-06		2 81E+00
8	1 25E+06	0 00E+00		0 00E+00	0 00E+00		0 00E+00	0 00E+00		0 00E+00
Total		5 90E-06		2 8454	5 90E-06		2 8669	5 90E-06		2 8827
Base CDF	5 90E-06		Risk Contribution:	0 35%		Risk Contribution:	1 16%		Risk Contribution:	1 75%
			from 3a and 3b:	9 88E-03		from 3a and 3b:	3 33E-02		from 3a and 3b:	5 04E-02
			3b LERF.	1 66E-08		3b LERF.	5 59E-08		3b LERF:	8 47E-08
			CCFP:	73.31%		CCFP:	73 98%		CCFP:	74 47%
From Estimated Change									10 to 15 Increase (Person-rem/yr):	1 58E-02
		Cylinder	Basemat	Total					3 to 15 Increase (Person-rem/yr)	3.73E-02
1 to 3 years		1 06%	0 26%						10 to 15 Delta-LERF:	2.89E-08
1 to 10 years		4 58%	1 15%						3 to 15 Delta-LERF:	6 82E-08
1 to 15 years		8 38%	2 10%						10 to 15 Delta-CCFP:	0 49%
Other Assumptions									3 to 15 Delta-CCFP:	1.16%
Containment Breach		100 0%	1 0%							
Visual Inspection Failures		10 0%	100 0%						3 to 15 Delta-LERF from Corrosion:	4 43E-09
EPRI Class 3a Fraction		90 0%	90 0%						10 to 15 Delta-LERF from Corrosion:	2 30E-09
EPRI Class 3b Fraction		10 0%	10 0%							
Increases to 3a and 3b Frequencies										
		0 0953%	0 0024%	0 0976%	0 4124%	0 0103%	0 4228%	0 7546%	0 0189%	0 7735%
		0 0106%	0 0003%	0 0108%	0 0458%	0 0011%	0 0470%	0 0838%	0 0021%	0 0859%
				0 1085%			0 4697%			0 8595%

Including Corrosion Effects (Sensitivity Case 3 - 15% Visual Inspection Failures)

Release type	Person-rem	Frequency	Base Case	Person-rem/yr	Frequency	Case 1	Person-rem/yr	Frequency	Case 2	Person-rem/yr
	Perry Dose	CDF	3 in 10 yrs	Dose	CDF	1 in 10 yrs	Dose	CDF	1 in 15 yrs	Dose
1	4 43E+03	1 41E-06		6 24E-03	9 71E-07		4 30E-03	6 30E-07		2 79E-03
2	1 25E+06	1 89E-08	Corrosion Addition	2 36E-02	1 89E-08	Corrosion Addition	2 36E-02	1 89E-08	Corrosion Addition	2 36E-02
3a	4 43E+04	1 65E-07	5 75E-09	7 31E-03	5 64E-07	3 29E-08	2 50E-02	8 73E-07	8 73E-07	3 87E-02
3b	1 55E+05	1 66E-08	6 39E-10	2 57E-03	5 67E-08	3 65E-09	8 80E-03	8 81E-08	8 81E-08	1 37E-02
7	6 54E+05	4 29E-06		2 81E+00	4 29E-06		2 81E+00	4 29E-06		2 81E+00
8	1 25E+06	0 00E+00		0 00E+00	0 00E+00		0 00E+00	0 00E+00		0 00E+00
Total		5 90E-06		2 8454	5 90E-06		2 8674	5 90E-06		2 8844
Base CDF	5 90E-06		Risk Contribution.	0 35%		Risk Contribution:	1,18%		Risk Contribution:	1 81%
			from 3a and 3b:	9 88E-03		from 3a and 3b:	3 38E-02		from 3a and 3b:	5.23E-02
			3b LERF.	1 66E-08		3b LERF.	5 67E-08		3b LERF:	8 81E-08
			CCFP:	73.31%		CCFP:	73 99%		CCFP:	74 53%
From Estimated Change									10 to 15 Increase (Person-rem/yr)	1 70E-02
		Cylinder	Basemat	Total					3 to 15 Increase (Person-rem/yr)	3 90E-02
1 to 3 years		0 71%	0 18%						10 to 15 Delta-LERF:	3 14E-08
1 to 10 years		4 06%	1 02%						3 to 15 Delta-LERF:	7 15E-08
1 to 15 years		9 40%	2 35%						10 to 15 Delta-CCFP:	0 53%
Other Assumptions									3 to 15 Delta-CCFP:	1 21%
Containment Breach		100 0%	1 0%							
Visual Inspection Failures		15 0%	100 0%						3 to 15 Delta-LERF from Corrosion:	7.82E-09
EPRI Class 3a Fraction		90 0%	90 0%						10 to 15 Delta-LERF from Corrosion:	4 80E-09
EPRI Class 3b Fraction		10 0%	10 0%							
Increases to 3a and 3b Frequencies										
		0 0959%	0 0016%	0 0974%	0 5481%	0 0091%	0 5572%	1 2690%	0 0212%	1.2902%
		0 0107%	0 0002%	0 0108%	0 0609%	0 0010%	0 0619%	0 1410%	0 0024%	0 1434%
				0 1083%			0 6192%			1 4335%

Including Corrosion Effects (Sensitivity Case 4 - 5% Visual Inspection Failures)

Release type	Person-rem	Frequency	Base Case	Person-rem/yr	Frequency	Case 1	Person-rem/yr	Frequency	Case 2	Person-rem/yr
	Perry Dose	CDF	3 in 10 yrs	Dose	CDF	1 in 10 yrs	Dose	CDF	1 in 15 yrs	Dose
1	4 43E+03	1 41E-06		6 26E-03	9 94E-07		4 41E-03	6 86E-07		3 04E-03
2	1 25E+06	1 89E-08	Corrosion Addition	2 36E-02	1 89E-08	Corrosion Addition	2.36E-02	1 89E-08	Corrosion Addition	2.36E-02
3a	4 43E+04	1 61E-07	1 98E-09	7.14E-03	5 42E-07	1 13E-08	2 40E-02	8.23E-07	8 23E-07	3 64E-02
3b	1 55E+05	1 61E-08	2 20E-10	2 50E-03	5 44E-08	1.26E-09	8 42E-03	8.26E-08	8.26E-08	1.28E-02
7	6 54E+05	4.29E-06		2 81E+00	4 29E-06		2 81E+00	4 29E-06		2.81E+00
8	1 25E+06	0 00E+00		0 00E+00	0 00E+00		0 00E+00	0 00E+00		0 00E+00
Total		5 90E-06		2 8452	5 90E-06		2 8661	5 90E-06		2 8816
Base CDF	5 90E-06		Risk Contribution:	0.34%		Risk Contribution.	1 13%		Risk Contribution.	1 71%
			from 3a and 3b:	9 65E-03		from 3a and 3b:	3 24E-02		from 3a and 3b:	4 92E-02
			3b LERF	1 61E-08		3b LERF.	5 44E-08		3b LERF:	8 26E-08
			CCFP:	73 31%		CCFP:	73 95%		CCFP:	74 43%
From Estimated Change									10 to 15 Increase (Person-rem/yr)	1 54E-02
		Cylinder	Basemat	Total					3 to 15 Increase (Person-rem/yr):	3 64E-02
1 to 3 years		0 71%	0 18%						10 to 15 Delta-LERF.	2 82E-08
1 to 10 years		4 06%	1 02%						3 to 15 Delta-LERF	6 64E-08
1 to 15 years		9 40%	2 35%						10 to 15 Delta-CCFP:	0 48%
Other Assumptions									3 to 15 Delta-CCFP:	1 13%
Containment Breach		100 0%	1 0%							
Visual Inspection Failures		5 0%	100 0%						3 to 15 Delta-LERF from Corrosion:	2 69E-09
EPRI Class 3a Fraction		90 0%	90 0%						10 to 15 Delta-LERF from Corrosion:	1 65E-09
EPRI Class 3b Fraction		10 0%	10 0%							
Increases to 3a and 3b Frequencies										
		0 0320%	0 0016%	0 0335%	0 1827%	0 0091%	0.1918%	0 4230%	0 0212%	0 4442%
		0 0036%	0 0002%	0 0037%	0 0203%	0 0010%	0 0213%	0 0470%	0 0024%	0 0494%
				0 0373%			0 2132%			0 4935%

Including Corrosion Effects (Sensitivity Case 5 - 100% to EPRI 3b for LERF)

Release type	Person-rem	Frequency	Base Case	Person-rem/yr	Frequency	Case 1	Person-rem/yr	Frequency	Case 2	Person-rem/yr

	Perry Dose	CDF	3 in 10 yrs	Dose	CDF	1 in 10 yrs	Dose	CDF	1 in 15 yrs	Dose
1	4 43E+03	1 41E-06		6 25E-03	9 83E-07		4 35E-03	6 58E-07		2 92E-03
2	1 25E+06	1 89E-08	Corrosion Addition	2 36E-02	1 89E-08	Corrosion Addition	2 36E-02	1 89E-08	Corrosion Addition	2 36E-02
3a	4 43E+04	1 59E-07	0 00E+00	7 06E-03	5 31E-07	0 00E+00	2 35E-02	7 97E-07	7 97E-07	3 53E-02
3b	1 55E+05	2 02E-08	4 29E-09	3 13E-03	7 76E-08	2 46E-08	1 20E-02	1 36E-07	1 36E-07	2 12E-02
7	6 54E+05	4 29E-06		2 81E+00	4 29E-06		2 81E+00	4 29E-06		2 81E+00
8	1 25E+06	0 00E+00		0 00E+00	0 00E+00		0 00E+00	0 00E+00		0 00E+00
Total		5 90E-06		2 8457	5 90E-06		2 8692	5 90E-06		2 8886

Base CDF 5 90E-06

Risk Contribution.	0 36%	Risk Contribution:	1 24%	Risk Contribution:	1 95%
from 3a and 3b·	1 02E-02	from 3a and 3b·	3 56E-02	from 3a and 3b·	5 64E-02
3b LERF,	2 02E-08	3b LERF	7 76E-08	3b LERF,	1 36E-07
CCFP·	73.37%	CCFP:	74 35%	CCFP·	75 35%
				10 to 15 Increase (Person-rem/yr)	1 94E-02
				3 to 15 Increase (Person-rem/yr)·	4 29E-02
				10 to 15 Delta-LERF,	5 88E-08
				3 to 15 Delta-LERF·	1 16E-07
				10 to 15 Delta-CCFP·	1 00%
				3 to 15 Delta-CCFP·	1 97%
				3 to 15 Delta-LERF from Corrosion:	5.26E-08
				10 to 15 Delta-LERF from Corrosion:	3.23E-08

From Estimated Change

	Cylinder	Basemat	Total
1 to 3 years	0 71%	0 18%	
1 to 10 years	4 06%	1 02%	
1 to 15 years	9 40%	2 35%	
Other Assumptions			
Containment Breach	100 0%	1 0%	
Visual Inspection Failures	10 0%	100 0%	
EPRI Class 3a Fraction	0 0%	0 0%	
EPRI Class 3b Fraction	100 0%	100 0%	

Increases to 3a and 3b Frequencies

0 0000%	0 0000%	0 0000%	0 0000%	0 0000%	0 0000%	0 0000%	0 0000%	0 0000%
0 0710%	0 0018%	0 0728%	0 4060%	0 0102%	0 4162%	0 9400%	0 0235%	0 9635%
		0 0728%			0 4162%			0 9635%

Including Corrosion Effects (Sensitivity Case 6 - 1% to EPRI 3b for LERF)

Release type	Person-rem	Frequency	Base Case	Person-rem/yr	Frequency	Case 1	Person-rem/yr	Frequency	Case 2	Person-rem/yr
	Perry Dose	CDF	3 in 10 yrs	Dose	CDF	1 in 10 yrs	Dose	CDF	1 in 15 yrs	Dose
1	4 43E+03	1 41E-06		6 25E-03	9 83E-07		4 35E-03	6 58E-07		2 92E-03
2	1.25E+06	1 89E-08	Corrosion Addition	2 36E-02	1 89E-08	Corrosion Addition	2 36E-02	1 89E-08	Corrosion Addition	2.36E-02
3a	4 43E+04	1 64E-07	4 25E-09	7 25E-03	5 55E-07	2 43E-08	2 46E-02	8 53E-07	8 53E-07	3 78E-02
3b	1 55E+05	1 60E-08	4 29E-11	2 48E-03	5 33E-08	2 46E-10	8 27E-03	8 02E-08	8 02E-08	1.24E-02
7	6 54E+05	4 29E-06		2 81E+00	4 29E-06		2 81E+00	4 29E-06		2 81E+00
8	1 25E+06	0 00E+00		0 00E+00	0 00E+00		0 00E+00	0 00E+00		0 00E+00
Total		5 90E-06		2 8453	5 90E-06		2 8665	5 90E-06		2.8824

Base CDF 5 90E-06

Risk Contribution:	0 34%	Risk Contribution:	1 15%	Risk Contribution:	1 74%
from 3a and 3b·	9 72E-03	from 3a and 3b;	3.29E-02	from 3a and 3b:	5 02E-02
3b LERF,	1 60E-08	3b LERF	5 33E-08	3b LERF,	8 02E-08
CCFP·	73 30%	CCFP·	73 94%	CCFP:	74 39%
				10 to 15 Increase (Person-rem/yr)	1 59E-02
				3 to 15 Increase (Person-rem/yr)	3.72E-02
				10 to 15 Delta-LERF:	2 69E-08
				3 to 15 Delta-LERF	6 42E-08
				10 to 15 Delta-CCFP:	0 46%
				3 to 15 Delta-CCFP·	1 09%
				3 to 15 Delta-LERF from Corrosion:	5 26E-10
				10 to 15 Delta-LERF from Corrosion:	3 23E-10

From Estimated Change

	Cylinder	Basemat	Total
1 to 3 years	0 71%	0 18%	
1 to 10 years	4 06%	1 02%	
1 to 15 years	9 40%	2 35%	
Other Assumptions			
Containment Breach	100 0%	1 0%	
Visual Inspection Failures	10 0%	100 0%	
EPRI Class 3a Fraction	99 0%	99 0%	
EPRI Class 3b Fraction	1 0%	1 0%	

Increases to 3a and 3b Frequencies

0 0703%	0 0018%	0 0720%	0 4019%	0 0100%	0 4120%	0 9306%	0 0233%	0 9539%
0 0007%	0 0000%	0 0007%	0 0041%	0 0001%	0 0042%	0 0094%	0 0002%	0 0096%
		0 0728%			0 4162%			0 9635%

Including Corrosion Effects (Sensitivity Case 7 - Lower Bound)

Release type	Person-rem	Frequency	Base Case	Person-rem/yr	Frequency	Case 1	Person-rem/yr	Frequency	Case 2	Person-rem/yr
	Perry Dose	CDF	3 in 10 yrs	Dose	CDF	1 in 10 yrs	Dose	CDF	1 in 15 yrs	Dose

1	4 43E+03	1 41E-06		6.26E-03	9 93E-07		4 40E-03	6 89E-07		3 05E-03
2	1 25E+06	1 89E-08	Corrosion Addition	2 36E-02	1 89E-08	Corrosion Addition	2 36E-02	1 89E-08	Corrosion Addition	2 36E-02
3a	4 43E+04	1 63E-07	3 25E-09	7 20E-03	5 45E-07	1 41E-08	2 41E-02	8 22E-07	8.22E-07	3 64E-02
3b	1 55E+05	1 60E-08	3 28E-11	2 47E-03	5 32E-08	1 42E-10	8.25E-03	7 99E-08	7 99E-08	1.24E-02
7	6 54E+05	4 29E-06		2 81E+00	4 29E-06		2 81E+00	4 29E-06		2 81E+00
8	1.25E+06	0 00E+00		0 00E+00	0 00E+00		0 00E+00	0 00E+00		0 00E+00
Total		5 90E-06		2 8452	5 90E-06		2 8661	5 90E-06		2 8811
Base CDF	5 90E-06		Risk Contribution.	0 34%		Risk Contribution.	1 13%		Risk Contribution:	1 69%
			from 3a and 3b:	9 67E-03		from 3a and 3b:	3 24E-02		from 3a and 3b:	4 88E-02
			3b LERF:	1 60E-08		3b LERF	5 32E-08		3b LERF.	7 99E-08
			CCFP:	73 30%		CCFP:	73 93%		CCFP:	74 39%

10 to 15 Increase (Person-rem/yr)		1 51E-02
3 to 15 Increase (Person-rem/yr)		3 59E-02
10 to 15 Delta-LERF		2 67E-08
3 to 15 Delta-LERF.		6 39E-08
10 to 15 Delta-CCFP;		0 45%
3 to 15 Delta-CCFP:		1 08%
3 to 15 Delta-LERF from Corrosion:		2.27E-10
10 to 15 Delta-LERF from Corrosion:		1.18E-10

From Estimated Change

	Cylinder	Basemat	Total
1 to 3 years	1 06%	0 26%	
1 to 10 years	4 58%	1 15%	
1 to 15 years	S 38%	2 10%	

Other Assumptions

Containment Breach	100 0%	1 0%
Visual Inspection Failures	5 0%	100 0%
EPRI Class 3a Fraction	99 0%	99 0%
EPRI Class 3b Fraction	1 0%	1 0%

Increases to 3a and 3b Frequencies

0 0524%	0 0026%	0 0550%	0 2268%	0 0113%	0 2382%	0 4151%	0 0208%	0.4358%
0 0005%	0 0000%	0 0006%	0 0023%	0 0001%	0 0024%	0 0042%	0 0002%	0 0044%
		0 0556%			0 2406%			0 4402%

Including Corrosion Effects (Sensitivity Case 8 - Upper Bound)

Release type	Person-rem Perry Dose	Frequency CDF	Base Case 3 in 10 yrs	Person-rem/yr Dose	Frequency CDF	Case 1 1 in 10 yrs	Person-rem/yr Dose	Frequency CDF	Case 2 1 in 15 yrs	Person-rem/yr Dose
1	4 43E+03	1 41E-06		6 26E-03	9 76E-07		4 32E-03	5 34E-07		2.37E-03
2	1 25E+06	1 89E-08	Corrosion Addition	2 36E-02	1 89E-08	Corrosion Addition	2 36E-02	1 89E-08	Corrosion Addition	2.36E-02
3a	4 43E+04	1 59E-07	0 00E+00	7 06E-03	5 31E-07	0 00E+00	2.35E-02	7 97E-07	7 97E-07	3 53E-02
3b	1 55E+05	1 78E-08	1 83E-09	2 75E-03	8 42E-08	3 11E-08	1 30E-02	2 60E-07	2 60E-07	4 03E-02
7	6 54E+05	4 29E-06		2 81E+00	4 29E-06		2 81E+00	4 29E-06		2.81E+00
8	1 25E+06	0 00E+00		0 00E+00	0 00E+00		0 00E+00	0 00E+00		0 00E+00
Total		5 90E-06		2 8454	5 90E-06		2 8702	5 90E-06		2 9073
Base CDF	5 90E-06		Risk Contribution:	0 34%		Risk Contribution.	1.27%		Risk Contribution.	2 60%
			from 3a and 3b:	9 81E-03		from 3a and 3b:	3 66E-02		from 3a and 3b:	7 56E-02
			3b LERF	1 78E-08		3b LERF.	8 42E-08		3b LERF	2 60E-07
			CCFP:	73 33%		CCFP:	74 46%		CCFP:	77 44%

10 to 15 Increase (Person-rem/yr)		3 71E-02
3 to 15 Increase (Person-rem/yr)		6 19E-02
10 to 15 Delta-LERF:		1 76E-07
3 to 15 Delta-LERF		2 42E-07
10 to 15 Delta-CCFP;		2 98%
3 to 15 Delta-CCFP:		4 11%
3 to 15 Delta-LERF from Corrosion:		1 79E-07
10 to 15 Delta-LERF from Corrosion:		1 49E-07

From Estimated Change

	Cylinder	Basemat	Total
1 to 3 years	0 20%	0 05%	
1 to 10 years	3 46%	0 86%	
1 to 15 years	20 07%	5 02%	

Other Assumptions

Containment Breach	100 0%	1 0%
Visual Inspection Failures	15 0%	100 0%
EPRI Class 3a Fraction	0 0%	0 0%
EPRI Class 3b Fraction	100 0%	100 0%

Increases to 3a and 3b Frequencies

0 0000%	0 0000%	0 0000%	0 0000%	0 0000%	0 0000%	0 0000%	0 0000%	0 0000%
0 0306%	0 0005%	0 0311%	0 5184%	0 0086%	0 5270%	3 0101%	0 0502%	3 0603%
		0 0311%			0 5270%			3 0603%